

APPENDIX G
BIOLOGICAL EVALUATION
BOTANY

Final Biological Evaluation
for
Endangered and Sensitive Plant Species

NICORE
Mining Proposal

Illinois Valley Ranger District

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June 7, 1999

Biological Evaluation

I. Introduction

A. Purpose:

The purpose of this biological evaluation (BE) is to compare the preferred alternative to the NICORE Mining Proposal from those alternatives discussed in the supplemental Draft Environmental Impact Statement, in sufficient detail to determine whether the Preferred Alternative will result in a trend toward Federal listing of any sensitive plant species.

B. Project summary:

The proposed project is called the "NICORE Mining Proposal." A Plan of Operation was submitted to the Illinois Valley Ranger District to develop 35 acres of nickel laterite mine pits, using a 14.3-mile haul route entirely on public lands located within the Rough and Ready Creek watershed. The project area is located in Josephine County, on the Illinois Valley Ranger District of the Siskiyou National Forest.

Legal location of the project area is:

T40S, R8W, Sec. 7, 18, 19, WM

T40S, R9W, Sec. 2, 3, 4, 8, 9, 10, 11, 12, 13, 14, 15, 16, 21, 22, 24, 25, 26, 27, 28, 33, 34, WM

Elevation in the project area ranges from approximately 1,300 feet to 4,200 feet.

C. Endangered, Threatened, and Sensitive Plants

Current management direction mandates conservation of several categories of rare plants on the Siskiyou National Forest. Protection of federally listed Endangered and Threatened species is mandated by the Endangered Species Act. No Threatened plants nor suitable habitat for Threatened plants is known to occur on the Siskiyou National Forest. Sensitive species are protected by USDA Forest Service regulations and manual direction. Some of the sensitive plant species are also listed as Species of Concern by USDI/FWS because their viability is of concern.

Arabis macdonaldiana is a federally listed Endangered plant known to occur on the Siskiyou National Forest. Several populations and unoccupied habitat are present in the project area.

Sensitive Plant species known or thought to be within the project area:
(see Appendix A for more information)

1. Sensitive Species:

<i>Calochortus howellii</i>	Howell's mariposa lily
<i>Cardamine nuttallii</i> var. <i>gemma</i>	Purple toothwort
<i>Epilobium oregonum</i>	Oregon willow herb
<i>Fritillaria glauca</i>	Siskiyou fritillary
<i>Gentiana setigera</i>	Elegant gentian
<i>Hastingsia atropurpurea</i>	Purple-flowered rush lily
<i>Limnanthes gracilis</i> var. <i>gracilis</i>	Slender meadowfoam
<i>Microseris howellii</i>	Howell's microseris
<i>Monardella purpurea</i>	Siskiyou monardella
<i>Perideridia erythrorhiza</i>	Red-root yampah
<i>Salix delnortensis</i>	Del Norte willow
<i>Senecio hesperius</i>	Siskiyou butterweed
<i>Streptanthus howellii</i>	Howell's streptanthus
<i>Viola primulifolia</i> ssp. <i>occidentalis</i>	Western bog violet

2. Species that were delisted since the Supplemental Draft Environmental Impact Statement was published and the Regional Forester's new Sensitive Plants List for Region 6, effective May 17, 1999.

<i>Epilobium rigidum</i>	Rigid willow-herb
<i>Hieracium bolanderi</i>	Bolander's hawkweed
* <i>Mimulus douglasii</i>	Douglas's monkeyflower
<i>Poa piperi</i>	Piper's bluegrass
<i>Sanicula peckiana</i>	Peck's snake root

*Also, delisted on BLM.

Determinations of effect in this BE are based on existing information and 1997 and 1998 field season surveys. General field surveys were done to assess habitat, ground conditions, and the presence or absence of sensitive plants in the project area. More intense field surveys were done to assess the proposed haul roads and the mining pit sites. *Arabis* expert Linda Vorobik and Forest Botanist Maria Ulloa surveyed the ridge location and the alternate route to mining site A, known *Arabis macdonaldiana* populations occur along this proposed haul route. Suitable habitat for sensitive plants also occurs along this route. Documentation of the findings were added to the project folder and discussed in the Supplemental Draft EIS.

Potential habitat for rare plant as assessed using a variety of sources: Soil Survey of Josephine County, Distribution Map of Ultramafic Rock & Nickel Deposits of South-western Oregon, Soil Resource Inventory of the Siskiyou National Forest, Oregon Natural Heritage Program Data Base, and sensitive plant population records on file at the Supervisor's and Illinois Valley Ranger District Offices of the Siskiyou National Forest. Sensitive plant surveys have been done in the same general area for: The Rough and Ready Creek Wild and Scenic River Eligibility Study, (FS), Rough and Ready Area of Critical Environmental Concern (BLM), Rough and Ready Botanical

Area (FS), A Preliminary Flora of the Rough and Ready Creek Watershed (Borgias), and Rough and Ready Botanical Wayside (State). The Proposed Project area and alternate routes were surveyed during the 1997 and 1998 field seasons.

The preferred action is Alternative 9. Alternative 9 will allow the miner to use the road from the south to "walk" the equipment to site B and to transport the equipment by helicopter to the other mining sites; to transport the material by helicopter to a stockpiling site. The road to site B will not be improved. I walked this road on April 6, 1999 to determine which species of plants could be impacted and to what extent.

II. Current Management Direction

A. Desired future condition and land allocations (see LRMP Chapter IV 87-90)

The Siskiyou National Forest Land and Resources Management Plan (LRMP) desired future condition (DFC) for the Rough and Ready Creek Botanical Area is described as follows: *"Natural and physical and biological processes will prevail without human intervention. Plant life inhabiting this ecosystem will continue to flourish. The goal is to protect, preserve, and enhance the exceptional botanical features of this area. Valid mineral claims existing prior to botanical area designation may be developed. Every effort should be made to protect botanical resources, especially sensitive plant species. Botanical areas may be recommended for withdrawal from mineral entry in situations where mitigation measures do not adequately protect management area values. The mineral potential of the area shall be assessed before withdrawal is recommended."* Additional NF lands in the project area are allocated by the Siskiyou NF LRMP (as amended by the NW Forest Plan) to Matrix, Administrative Study Area, and Riparian Reserve.

B. Forestwide Standards and Guidelines for Sensitive Plants (see LRMP Chapter IV 26-27).

Standards and guidelines applicable at the project level are:

Monitor the effects of management activities on sensitive plants. If monitoring results show a decline in species viability, alter management strategy.

Analyze the potential effects of all ground-disturbing projects on sensitive plants and their habitat. Mitigate project effects to avoid a decline in species viability at the Forest level.

Map, record, and protect essential habitat for known and sensitive plant species. Species management guides should be prepared to address the effects of land management activities on local populations of sensitive species at a broader scale, and to identify opportunities to enhance and develop habitat.

III. Description of Proposed Project

Proposed Action: The Proposed Action is described in the Plan of Operation submitted by the miner. The operation would extract nickel laterite from four deposits located in section 22, 8, 11 and 16 of T.40S., R.9W., Willamette Meridian. The areas to be mined total approximately 35 acres, all within the Rough and Ready Creek Watershed Area (proposed areas to be impacted are identified on the attached maps, Appendix C).

The key components of the Proposed Plan of Operation were discussed in the Biological Evaluation for the Draft Environmental Impact Statement (DEIS), January 26, 1998. An additional range of alternatives was discussed in the Biological Evaluation for the Supplemental Draft Environmental Statement of October 27, 1998. Implementation of the proposed project is planned over a 10 year schedule plan.

Alternatives: There are six alternatives to the proposed action. The impacts on sensitive plants by the proposed action, the no action alternative, the preferred alternative (Alternative 9) and the five remaining alternatives for the Final Environmental Impact Statement (FEIS) are compared in Appendix A. Appendix A also shows the status of the sensitive plants and reflects the changes that have occurred since the Supplemental Draft Environmental Statement was published.

IV. Existing Environment

For more information and further discussion on other vascular plants of concern, and information on vegetation and soils for this watershed, see the West Fork Illinois River Watershed Analysis files.

During the fall of 1997, spring/summer/fall 1998, and Spring 1999 I was able to survey and walk the roads that access mining site B from the north and south end, the road to mining site C, and part of the proposed road to mining site A. The primary reason I walked the roads was to observe if any of the disturbed areas have naturally revegetated over time. In the areas with better soils there is evidence of natural revegetation is very sparse. Herbaceous annuals and perennials were present on the sites where sampling and prospecting had occurred; tree seedlings were present on some of the roads and prospecting sites. Field observations and lack of past records indicates that no efforts have been made to revegetate the disturbed sites or the roads. Motorized vehicles are not driven on these roads by the public; most of the use is by hikers and horseback riders, except for road 461, which showed evidence of vehicle traffic.

A. Species accounts

Only new populations are shown on the Final Biological Evaluation. Refer to NICORE Sensitive Plant Biological Evaluation January 26, 1998 for previously discussed known population sites and to the Supplemental Draft Biological Evaluation of October 27, 1998 for additional sites found during the 1998 field season.

Macdonald's rockcress (*Arabis macdonaldiana*) is endemic to the Red Mountain area in the North Coast Range of California; this species is federally protected as Endangered. The USDI/FWS made a decision in 1997 that all known populations of *Arabis macdonaldiana* share the same taxonomy and genetic material. It occurs on barren to shrub-covered shallow, rocky, ultramafic soils which are peridotite in origin (Jeffrey pine woodland community). Elevation ranges from 500 to 4,000 feet. Known populations on the Siskiyou NF are found between North Fork Smith River and Diamond Creek, Packsaddle Mountain and East Fork Illinois River. *Arabis macdonaldiana* occurrences were confirmed by Dr. Linda Vorobik. These populations extend the range of this species in Oregon. The preferred Alternative 9 will avoid all known populations and known unoccupied habitat. Known populations in the project area: 6

Howell's mariposa lily (*Calochortus howellii*) is endemic to the Illinois Valley in southwest Oregon. It occurs on serpentine soils, dry rocky slopes, often on Ceanothus brush-covered slopes or in open Jeffrey pine stands, from 800 to 4,200 feet elevation. The northernmost known populations on the Siskiyou NF occurs just north of Eight Dollar Mountain and the southernmost site is at the foot of Oregon Mountain. Between these two sites, additional populations are discontinuous and scattered. The westernmost population occurs at Oregon Mountain and the most eastern population known is in Democrat Gulch. Most populations are sparse and scattered. Known populations in the project area: 17

Purple toothwort (*Cardamine nuttallii* var. *gemmata*) is endemic to the Siskiyou Mountains of Josephine and Curry Counties, Oregon to adjacent Del Norte and possibly Siskiyou Counties, California. It occurs on gravelly serpentine soils on ridges, Jeffrey pine forests, near *Darlingtonia* bogs, and at a wide range of elevations. Known populations on the Siskiyou NF occur at Red Mountain, Oregon Mountain, Waldo, Snow Camp, Wimer Road, Tincup Pass, Canyon Creek, Eight Dollar Road, Pearsoll Peak, Lemmingsworth Gulch, and Vulcan Peak. Known populations in the project area: 5

Oregon willow-herb (*Epilobium oreganum*) is a Klamath Province endemic occurring in *Darlingtonia* bogs, and other wet serpentine areas from 500 to 7800 feet elevation. All extant populations in Oregon are found on scattered sites in Josephine County. In California, it is found in Siskiyou, Trinity and Humboldt Counties. Known populations on the Siskiyou NF occur along the west side of the Illinois Valley. The majority of plants are found from Eight Dollar Mountain southwest to Josephine Creek. At the south end of its range in Oregon it is found along the Oregon Mountain Road. Most populations are less than 100 plants. Known populations in the project area: 2

Siskiyou fritillaria (*Fritillaria glauca*) is known from southern Douglas County, south through the Siskiyou Mountains of Josephine and Curry Counties in Oregon and into California. It occurs on gravelly serpentine slopes and ridges, from 1,800 to 6,400 feet elevation. On the Siskiyou NF this plant is found in about 20 geographical areas. There is one off-forest site at Waldo Lookout. Known populations in the project area: 6

Elegant gentian (*Gentiana setigera*) known from Siskiyou Mountains in southwestern Oregon and northern California. It occurs on serpentine wet meadows, bogs, and seeps on slopes at low elevation. On the Siskiyou NF this plant is found in 10 geographical areas.

Known populations in the project area: 3

Purple-flowered rush lily (*Hastingsia atropurpurea*) has a limited range, from Eight Dollar Mountain along the west side of Illinois Valley south to Parker Creek in Josephine County; it occurs on wet meadows, rocky seeps, serpentine *Darlingtonia* bogs, often in open areas on gentle slopes, and streambanks in partial shade, from 1,600 to 2,000 feet elevation. Known locations on the Siskiyou NF include Eight Dollar Mountain, Woodcock Creek, Josephine Creek, and Days Gulch. A population of two plants was reported at Rough and Ready Creek in 1989, next to the crossing of road 442/441. This population was not relocated in 1997. I assumed this population was extirpated.

Known populations in the project area: none

Slender meadowfoam (*Limnanthes gracilis* var. *gracilis*) is geographically restricted to Josephine and (historically) Jackson County. Historic collections from Douglas County need verification. All populations are found below 2,500 feet elevation on sunny, vernal wet meadows and stream edges, in valleys and low foothills, including soils formed from ultramafic rocks.

Known populations in the project area: none

Howell's microseris (*Microseris howellii*) is geographically restricted to serpentine areas of the Siskiyou Mountains in southern Josephine County, Oregon, especially on the west edge of the Illinois Valley. All populations are on soils formed from ultramafic rocks from 1,000 to 3,500 feet elevation. Habitat consists of slopes or flat ground with varying exposures, predominantly within Jeffrey pine/incense cedar/chaparral vegetation. Known populations on the Siskiyou NF occur on Rough and Ready Flat, Illinois River, Eight Dollar Mountain, Oregon Mountain, Days Gulch, Eagle Gap, Tennessee Mountain, Wimer Road, and Cedar Log Bog. It is found off-forest along Deer Creek, Woodcock Bog, and Waldo.

Known populations in the project area: 8

Siskiyou monardella (*Monardella purpurea*) is known from Curry and Josephine Counties, Oregon and adjacent California, where it grows on rocky, open slopes on serpentine soils or serpentine bedrock from 1,400 to 4,000 feet elevation. Also found on chaparral, woodland and montane forest. Typical associates include Jeffrey pine, western white pine, and coffeeberry. Known populations on the Siskiyou NF are documented from the trail to Silver Peak, Lemmingsworth Gulch, Oregon Mountain, York Creek, Vulcan Peak, Rough and Ready Creek, and Weston Ridge.

Known populations in the project area: 4

Red-root yampah (*Perideridia erythrorhiza*) Known from Douglas, Klamath, and Josephine Counties in Oregon, where it inhabits vernal moist depressions in heavy, poorly drained soils. Typical vegetation types associated with this plant are oak or pine woodlands below 5,000 feet in the Cascade Mountains. Josephine County sites

are in serpentine habitats. On the Siskiyou NF it has been found on Josephine Creek and Rough and Ready Botanical Area. There are two locations off forest at Eight Dollar Mountain.

Known populations in the project area: 1

Del Norte willow (*Salix delnortensis*) is known from Curry and Josephine County in Oregon and Del Norte County in California, where it grows on streambeds, streambanks, and gullies on serpentine soils, below 1,500 feet elevation. Known populations on the Siskiyou NF are at Rough and Ready Creek, Josephine Creek, Box Canyon Creek, Star Flat, Cedar Camp, Road to Snow Camp, Meadow Creek, Quosatana Creek, headwaters of Hunter Creek, and Wimer Road.

Known populations in the project area: 4

Siskiyou butterweed (*Senecio hesperius*) is endemic to the Illinois Valley area of southern Josephine County, Oregon, where it grows on serpentine soils at lower elevations, on gentle to moderate slopes. Generally found in open Jeffrey pine savannah. Most of the known populations are within the boundaries of the Illinois Valley Ranger District. Known populations on the Siskiyou NF occur along Free and Easy Creek, Eight Dollar Mountain and vicinity, Cedar Log RNA, Josephine Creek, Rough and Ready Creek, and West Fork Illinois River. It is found off forest along Laurel Road, Woodcock Bog, and Waldo Hill.

Known populations in the project area: 12

Howell's streptanthus (*Streptanthus howellii*) is known from the Siskiyou Mountains, Josephine and Curry Counties in Oregon, and Del Norte and Siskiyou Counties in California. It grows on dry, rocky, serpentine slopes in conifer/hardwood forests; at 1,000 to 4,500 feet elevation. Known populations on the Siskiyou NF are found near the California line on the road to Sanger Peak, Rock Creek, Cedar Creek, Snow Camp, Lemmingsworth Gulch, Wimer Road, Vulcan Peak, Carpenter Gulch, Eight Dollar Mountain, Josephine Mountain, and South Chetco Rim Trail.

Known populations in the project area: 29

Western bog violet (*Viola primulifolia* ssp. *occidentalis*) is known from Curry and Josephine Counties, Oregon and Del Norte County, California. It is found in *Darlingtonia* bogs and streams on serpentine soils at lower elevations. Most of the known populations on the Siskiyou NF are within the boundaries of the Illinois Valley Ranger District.

Known populations in the project area: 2

B. Habitat status

Field visits, surveys, and past records indicate that parts of the Rough and Ready Creek watershed area have been previously roaded and mined. The watershed includes private inholdings. The private inclusions were not surveyed for this analysis. Botanically, we do not have a system in place to analyze past or cumulative impacts to sensitive plant populations or their habitat.

Ultramafic:

The Siskiyou National Forest Soil Survey map of the Rough and Ready Creek area shows large polygons of ultramafic soils in the project area that may be suitable habitat for: Macdonald's rockcress, Howell's mariposa lily, purple toothwort, Oregon willow herb, Siskiyou fritillary, purple-flowered rush lily, slender meadowfoam, Howell's microseris, Siskiyou monardella, red-root yampah, Del Norte willow, Siskiyou butterweed, Howell's streptanthus, and western bog violet.

These species all inhabit ultramafic sites, which have soil mineral imbalances that preclude dense tree or shrub sites from growing; therefore the plants are found in forest openings or even barrens. These areas are sometimes incidentally disturbed or destroyed by roadbuilding, skid trails, mining, and recreation. Although portions of the project area have been impacted by mining activities for the past five decades, most of the suitable ultramafic habitat for serpentine endemic plants is intact or, if disturbed, is still within the tolerance limits of the species of concern.

Riparian Habitats:

Riparian habitats throughout the project area may be suitable habitat for Oregon willow-herb, purple-flowered rush lily, and western bog violet. Several riparian areas were field surveyed for these species, and although similar species were present in some drainages, these species were not found in the Rough and Ready Creek area. Whether this means the habitat is unsuitable or the species have not dispersed into this area is not known. Three small populations of Oregon willow-herb have been found in the fens off the Wimer road in the Oregon Mountain Botanical Area.

Perennial riparian habitat is present in the project area, but is limited to a few larger drainages, spring-fed seeps, and *Darlingtonia* fens. The riparian habitat has been impacted lightly, mostly to build roads and to divert water. Water diversion has created habitat which has been colonized by several species of aquatic plants, including uncommon species.

Rock Outcrops:

Rock outcrops are common throughout the project area and appear to be suitable habitat for stonecrops. Some rock outcrops have been affected by road building, mining, and other past disturbances in the project area. A few may have been used as rock sources for road material. Rock outcrops should be surveyed if rock material is needed from any of these sites.

Forested Habitats:

The project area has not been logged or roaded for timber management production. The area has not changed from its historic state; it does not carry the legacy of effects from

timber harvesting. Purple toothwort prefers Jeffrey pine forested habitat. This habitat type, though not pristine, is still well distributed and plentiful throughout the project area.

V. Effects of the Proposed Project

A. Direct and indirect effects

Direct negative effects to endangered or sensitive and endemic plants from mining operations can include uprooting, burial, or crushing of plants while excavating the mining sites, and upgrading, maintaining or building roads. Placement of landings or stock piling of rock on rare plant populations can also crush or bury individuals or whole populations. Negative effects may have already occurred in the area from previous mining operations and related impacts. All the project areas were surveyed. The preferred alternative is Alternative 9, the areas that have sensitive plants will be flagged by a botanist, to make sure that the least number of plants is impacted.

Indirect effects to plants and suitable habitat include soil disturbance that may render the habitat unsuitable for the rare plants. Depending on the degree of disturbance and the species in question, soil disturbance can have both positive and negative effects. Light disturbance may favor seedling establishment of Howell's mariposa lily and Howell's streptanthus in openings on favorable soils; these species are able to colonize disturbed sites unless outcompeted by weeds or unless the soil is repeatedly disturbed. There are less than 20 individuals of *Calochortus howellii* on road # 461 that accesses mining site B from the Southside. These individuals might be negatively impacted depending on the number of trips and the equipment type that will be walked to the area. If the impact is determined to be detrimental, these individuals will be removed and relocated to a light disturbed area of similar habitat or placed at the Berry Botanical Garden for study.

Intense soil disturbance would have negative effects on Howell's mariposa lily, Siskiyou fritillaria, red-root yampah, and Siskiyou butterweed. Effects of soil disturbance on Oregon willow-herb are unclear. Heavy soil disturbance, especially churning and compaction, is incompatible with maintenance of suitable habitat for rare plants--they will neither survive nor colonize churned up or compacted soils.

In the project areas, suitable ultramafic habitat is available for several species, but unoccupied (see habitat status section above). A portion of the unoccupied habitat is adjacent or included in the areas to be impacted, and may be disturbed during mining operations.

Soil disturbance also invites weed infestation, especially in areas along roads where weed seeds can be easily brought in on vehicles and equipment. Once established, weeds can outcompete native plants and prevent restoration of native vegetation on the site (see Appendix B, Supplemental Botanical Report, for further discussion). Weed competition is not a significant threat to sensitive plant populations in this project area. Preventive treatments to all equipment to avoid the introduction of *Phytophthora lateralis* would also prevent the spread of noxious and invasive weeds.

Wet areas that may provide habitat for elegant gentian, Oregon willow-herb, western bog violet, and purple-flowered rush lily will be largely protected by project design standards, since these species are confined to *Darlingtonia* fens, perennial water or spring-fed seeps; localized negative effects on riparian habitats are described in the Physical Science report and would be avoided during project implementation by selecting Alternative 9. Water diversion ditches found throughout this watershed have had negative impacts in the short-term but in the long term turned out to be a positive. Several local native species have colonized this long-ago-created habitat.

B. Cumulative effects

Since the early 1900's, much of the project area has been impacted by mining exploration, mining, road building, and botanical collecting of rare plants for the horticultural trade. There are non national forest lands in the project area, so cumulative effects of activities on private, state, or other federal lands is an issue. Many of the private parcels have been logged and cleared for home building and homesteads. Potential habitat for sensitive plants appears to be present, and the Oregon Natural Heritage Program Data Base contains reports of sensitive plants from private individuals. No data collecting was done to determine the effect of the mining activities of private land owners.

We cannot save all individual sensitive plants, if mining, road building, road reconstruction, and continued public use occur; but we can minimize the impacts to the sensitive plant populations.

If the laterite mining proved successful, more habitat and individual plants would likely be disturbed as more of the deposit was mined. Cumulative effects are not precisely known, since the population distribution on all laterite deposits have not been inventoried. Plants found along the haul route and within the mine sites are also likely to be found in adjacent areas. Additional surveys would be needed for future Plans of Operations that disturb more lands.

C. Compliance with management direction

This Biological Evaluation has documented the completion of the steps outlined in the 2670 section of the Forest Service Manual, and Siskiyou National Forest LRMP direction for management of sensitive plants, including the Aquatic Conservation Strategy.

VI. Determinations

The NICORE mining proposal may have the following effects on listed and sensitive plants:

Arabis macdonaldiana - The Preferred Alternative 9, the No Action Alternative, and Alternative 11 will have **No Effect to individuals or habitat.**

The proposed action and alternatives 6, 7, 8, and 10 **May Affect - Likely to adversely affect individuals or habitat.** Rerouting the road in Alternatives 6, 7, 8, from mining site

C to mining site A to avoid these populations and its habitat would decrease the finding to **May Affect - Not likely to adversely affect individuals or habitat.**

Calochortus howellii - The Preferred Alternative 9 and the No Action Alternative is associated with a **may impact** individuals or habitat, but is **not likely to result in a trend toward federal listing** or loss of viability for the species because of the existing roads. The proposed action and alternatives **6, 7, 8, 10, 11** ***will impact** individuals or habitat with a consequence that the action **may contribute to a trend towards federal listing** or loss of viability to the population or species.

Cardamine nuttallii var. *gemmata* - The Preferred Alternative 9, the No Action Alternative, and Alternative 11 has a determination of **No Impact**. The Proposed Action and alternatives 6, 7, 8, and 10 **may impact** individuals or habitat, but **will not likely contribute to a trend towards federal listing** or cause loss of viability to the population or species.

Epilobium oreganum - The Preferred Alternative 9, the Proposed Action, the No Action Alternative, and Alternatives 6, 7, 8, and 11 have determinations of **No Impact**. Alternative 10 **may impact** individuals or habitat, but **will not likely contribute to a trend towards federal listing** or cause loss of viability to the population or species.

Gentiana setigera - The Preferred Alternative 9, the Proposed Action, the No Action Alternative, and Alternatives 6, 7, 8, and 11 have determinations of **No Impact**. Alternative 10 ***will impact** individuals or habitat, with a consequence that the action **may contribute to a trend towards federal listing** or cause a loss of viability to the population or species.

Fritillaria glauca - The Preferred Alternative 9 has a determination of **No Impact**. The Proposed Action and Alternatives 6, 7, 8, 10, 11 **may impact** individuals or habitat, but **will not likely contribute to a trend towards federal listing** or cause loss of viability to the population or species.

Microseris howellii - The Preferred Alternative 9 and the No Action Alternative have determinations of **No Impact**. The Proposed Action and Alternatives 6, 7, 8, 10, and 11 ***will impact** individuals or habitat, with a consequence that the action **may contribute to a trend towards federal listing** or loss of viability to the population or species.

Monardella purpurea - The Preferred Alternative 9 and the No Action Alternative have determinations of **No Impact**. The Proposed Action and Alternatives 6, 7, 8, 10 and 11 ***will impact** individuals or habitat, with a consequence that the action **may contribute to a trend towards federal listing** or cause loss of viability to the population or species.

Perideridia erythrorhiza - The Preferred Alternative and the No Action Alternative have determinations of **No Impact**. The Proposed Action and Alternatives 6, 7, 8, 10, and 11 will affect one population, but because there are few known sites the project ***will impact** individuals or habitat, with a

consequence that the action **may contribute to a trend towards federal listing** or loss of viability to the population or species.

Salix delnortensis - The Preferred Alternative 9, and the No Action Alternative have determinations of **No Impact**.

Proposed Action and Alternatives 6, 7, 8, 10, and 11 **may impact** individuals or habitat, but **will not likely contribute to a trend towards federal listing** or cause loss of viability to the population or species.

Senecio hesperius - The Preferred Alternative 9 and the No Action Alternative **may impact** individuals but is **not likely to result in a trend towards federal listing** or cause loss of viability to the population or species.

The Proposed Action, and Alternatives 6, 7, 8, 10, and 11 ***will impact** individuals or habitat, with a consequence that the action **may contribute to a trend towards federal listing** or loss of viability to the population or species.

Streptanthus howellii - The Preferred Alternative 9 ***will impact** individuals or habitat but is **not likely to result in a trend towards federal listing** or cause loss of viability to the population or species.

The No Action Alternative **may impact** individuals, but is **not likely to result in a trend towards federal listing** or cause loss of viability to the population or species.

The Proposed Action and Alternatives 6, 7, 8, 10, and 11 ***will impact** individuals or habitat, with a consequence that the action **may contribute to a trend towards federal listing** or loss of viability to the population or species.

Viola primulifolia ssp. *occidentalis* - The Preferred Alternative 9, and the No Action Alternative have determinations of **No Impact**.

The Proposed Action and Alternatives 6, 7, 8, 11 will come close to a fen where one population grows, but the site will not be impacted. Alternative 10 will impact Road 4402; project road widening and maintenance **may impact** individuals or habitat but **will not likely contribute to a trend towards federal listing** or cause loss of viability to the population or species.

* The "**will impact**" associated with these species is based on the fact that these plants are on the Oregon Natural Heritage Program List 1 or potential impact sites are within "selected habitat" identified in Draft Species Management Guides. The "**will impact**" may be reduced with changes in road design to protect the potential impact sites. The FS, BLM, and miner will collaborate on ways to avoid and minimize impacts to sensitive plants and their habitat before any ground disturbing activities occur. See Management Recommendations for more information.

VII. Management Recommendations

- These recommendations are consistent with Forest Service policy to: "*Develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service Actions*" (FSM 2670.22).

The following measures would minimize impacts to plant species of concern, even without knowing the exact locations of all listed, sensitive and endemic plants and their habitats in the project area:

- 1) Harvest bulbs of *Calochortus howellii* present on the access road # 4402-461 and re-plant at a suitable location or distribute among interested botanical gardens for conservation purposes.
- 2) Avoid piling excess material and parking equipment on serpentine areas that have not been approved for project uses.
- 3) Follow Region 6 policy on use of native plant material in restoration and other revegetation projects (4/14/94), when reseeding disturbed areas following project activities. See Appendix B for more information on this policy.
- 4) Use care to minimize soil disturbance on those areas that have known populations of sensitive or endemic plants.
- 5) Flag and avoid known populations of sensitive plants during mining operations; **e.g. sites with sensitive plant populations will not be used as sites for piling and depositing tailings.**
- 6) Do not impact suitable habitat for *Arabis macdonaldiana*.
- 7) Maintain the existing environment around Riparian areas and *Darlingtonia* fens, especially hydrological integrity.
- 8) Identified suitable habitat for sensitive plants and avoid or minimize impacts.
- 9) Use existing roads to stockpile material that would be removed from sample sites; utilize material to fill the mine pits.
- 10) Develop a revegetation plan that will enhance and protect the existing flora.

VIII. Literature Cited:

Eastman, Donald C. 1990. Rare and Endangered Plants of Oregon. Beautiful America Publishing Company. Wilsonville, Oregon. 194 pp.

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IX. Contributors

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NICORE Mining Proposal - FEIS - Alternative Comparison

Species (common name)	Proposed Action	Alt. 6 Impacted	Alt. 7 Impacted	Alt. 8 Impacted	Alt. 9 Impacted Preferred	Alt. 10 Impacted	Alt. 11 Impacted
<i>Arabis macdonaldiana</i> LE Macdonald's rockcress	1	5	5	5		3	
<i>Calochortus howellii</i> Howell's mariposa-lily	12	14	16	16	1	10	5
<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort	1	4	4	4		5	
<i>Epilobium oreganum</i> Oregon willow-herb						3	
<i>Fritillaria glauca</i> Siskiyou fritillaria	4	1	5	5		4	4
<i>Gentiana setigera</i> Elegant gentian						3	
<i>Hastingsia atropurpurea</i> purple-flowered rush-lily							
<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam							
<i>Microseris howellii</i> Howell's microseris	5	7	13	7		8	6
<i>Monardella purpurea</i> Siskiyou monardella	2	3	5	4		11	3
<i>Perideridia erythrorhiza</i> Red-root yampah	1	1	1	1			1
<i>Salix delnortensis</i> Del Norte willow	7	6	7	1		1	1
<i>Senecio hesperius</i> Siskiyou butterweed	7	7	13	7	1	11	5
<i>Streptanthus howellii</i> Howell's streptanthus	16	16	14	9	8	20	13
<i>Viola primulifolia</i> ssp. <i>occidentalis</i> western bog violet	1		1	1		2	
Total # sites impacted	57	64	84	60	10	81	38
Species	11	10	11	11	3	12	8

Proposed Action - Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Number of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress	1	O-1, FS-LE	5647
CAHO	<i>Calochortus howellii</i> Howell's mariposa-lily	12	O-1, BLM-S, FS-S	5638, 5628, 5670, 5626, 5653, 5653, 5673, 5673, 5969, 5653, 5653, 5653
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort	1	O-4, BLM-S, FS-S	5689
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb		O-1, BLM-S, FS-S	
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria	4	O-2, BLM-A, FS-S	5623-#3, 5623-#4, 5623#6, 5623-#5
GESE2	<i>Gentiana setigera</i> Elegant gentian		O-1, FS-S	
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris	5	O-1, BLM-S, FS-S, State-T	5996, 5974, 5641, 5683, 5641
MOPU	<i>Monardella purpurea</i> Siskiyou monardella	2	O-2, BLM-A, FS-S	5680, 5669
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah	1	O-1, BLM-S, FS-S	5656
SADE2	<i>Salix delnortensis</i> Del Norte willow	6	O-2, BLM-A, FS-S	5651, 5668, 5668, 5668, 5390, 5390
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	7	O-1, BLM-S, FS-S	5627, 5625, 5655, 5655, 5636, 5655, 5655
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	16	O-1, BLM-S, FS-S	5697, 5697, 5697, 5697, 5699, 5972, 5719, 6008, 6008, 6008, 5696, 5696, 5696, 5973, 5973, 5973
VIPRO	<i>Viola primulifolia</i> ssp. <i>occidentalis</i> western bog violet	1	O-1, BLM-S, FS-S	5665

Alternative 6 - Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Alt. 6 # of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress	5	O-1, FS-E	5695, 5685, 5976, 6009, 6009
CAHO3	<i>Calochortus howellii</i> Howell's mariposa-lily	14	O-1, BLM-S, FS-S	5673, 5673, 5681, 5679, 5969, 5657, 5653 (+3), 5628, 5670, 5626, 5145
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort	4	O-4, BLM-S, FS-S	5689, 5688, 5690, 5694
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb		O-1, BLM-S, FS-S	
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria	1	O-2, BLM-A, FS-S	5691
GESE2	<i>Gentiana setigera</i> Elegant gentian		O-1, FS-S	
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris	7	O-1, BLM-S, FS-S, State-T	5678, 5977, 5674, 5683, 5641, 5988, 5996
MOPU2	<i>Monardella purpurea</i> Siskiyou monardella	3	O-2, BLM-A, FS-S	5669, 5680,
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah	1	O-1, BLM-S, FS-S	5656
SADE2	<i>Salix delnortensis</i> Del Norte willow	6	O-2, BLM-A, FS-S	5390, 5390, 5668, 5668, 5668, 5993
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	7	O-1, BLM-S, FS-S	5144, 5625, 5627, 5676, 5636, 5655, 5682
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	16	O-1, BLM-S, FS-S	5697 (+3), 5698, 5655, 5655, 5972, 5973 (+2), 5719, 5719, 6008 (+2)
VIPRO	<i>Viola primulifolia</i> ssp. <i>oc-</i> <i>cidental</i> western bog violet		O-1, BLM-S, FS-S	

Alternative 7 - Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Alt. 7 # of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress	5	O-1, FS-LE	5647, 5676, 5686, 6009, 6009
CAHO3	<i>Calochortus howellii</i> Howell's mariposa-lily	16	O-1, BLM-S, FS-S	5145, 5638, 5628, 5670, 5626, 5653, 5653, 5653, 5653, 5673, 5673, 5675, 5969, 5664, 5679, 5681
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort	4	O-4, BLM-S, FS-S	5688, 5689, 5690, 5694
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb		O-1, BLM-S, FS-S	
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria	5	O-2, BLM-A, FS-S	5623-#3, 5623-#4, 5623#6, 5623-#5, 5691,
GESE2	<i>Gentiana setigera</i> Elegant gentian		O-1, FS-S	
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris	13	O-1, BLM-S, FS-S, State-T	5996, 5974, 5641, 5683, 5641, 5667, 5683, 5678, 5986, 5988 (+3)
MOPU	<i>Monardella purpurea</i> Siskiyou monardella	5	O-2, BLM-A, FS-S	5680, 5669, 5642, 5737, 5627, 5677
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah	1	O-1, BLM-S, FS-S	5656
SADE2	<i>Salix delnortensis</i> Del Norte willow	7	O-2, BLM-A, FS-S	5651, 5390, 5390, 5668, 5668, 5668, 5993
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	13	O-1, BLM-S, FS-S	5627, 5625, 5655 (+3), 5636, 5629, 5676, 5682, 5674, 5987, 5987
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	14	O-1, BLM-S, FS-S	5697, 5697, 5697, 5697, 5699, 5972, 5719, 5719, 5696, 5696, 5696, 5973, 5973, 5973
VIPRO	<i>Viola primulifolia</i> ssp. <i>occidentalis</i> western bog violet	1	O-1, BLM-S, FS-S	5665

Alternative 8 - Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Alt. 8 # of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress	5	O-1, FS-LE	5647, 5976, 5686, 6009, 6009,
CAHO3	<i>Calochortus howellii</i> Howell's mariposa-lily	16	O-1, BLM-S, FS-S	5638, 5653, 5653, 5673, 5673, 5673, 5673, 5673, 5969, 5653, 5653, 5653, 5657, 5664, 5679, 5681
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort	4	O-4, BLM-S, FS-S	5688, 5689, 5690, 5694
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb		O-1, BLM-S, FS-S	
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria	5	O-2, BLM-A, FS-S	5623-#3, 5623-#4, 5623#6, 5623- #5, 5691
GESE2	<i>Gentiana setigera</i> Elegant gentian		O-1, FS-S	
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris	7	O-1, BLM-S, FS-S, State-T	5996, 5641, 5683, 5641, 5667, 5683, 5678
MOPU	<i>Monardella purpurea</i> Siskiyou monardella	4	O-2, BLM-A, FS-S	5669, 5642, 5737, 5627
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah	1	O-1, BLM-S, FS-S	5656
SADE2	<i>Salix delnortensis</i> Del Norte willow	2	O-2, BLM-A, FS-S	5651, 5668
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	7	O-1, BLM-S, FS-S	5655, 5655, 5636, 5629, 5676, 5682, 5674
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	9	O-1, BLM-S, FS-S	5972, 5719, 5719, 5973, 5973, 5973, 6008, 6008, 6008
VIPRO	<i>Viola primulifolia</i> ssp. <i>oc-</i> <i>cidentalis</i> western bog violet	1	O-1, BLM-S, FS-S	5665

Alternative 9 - Preferred Alternative

Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Alt. 9 # of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress		O-1, FS-LE	
CAHO3	<i>Calochortus howellii</i> Howell's mariposa-lily	1	O-1, BLM-S, FS-S	5643
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort		O-4, BLM-S, FS-S	
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb		O-1, BLM-S, FS-S	
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria		O-2, BLM-A, FS-S	
GESE2	<i>Gentiana setigera</i> Elegant gentian		O-1, FS-S	
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris		O-1, BLM-S, FS-S, State-T	
MOPU	<i>Monardella purpurea</i> Siskiyou monardella		O-2, BLM-A, FS-S	
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah		O-1, BLM-S, FS-S	
SADE2	<i>Salix delnortensis</i> Del Norte willow		O-2, BLM-A, FS-S	
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	1	O-1, BLM-S, FS-S	5711
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	8	O-1, BLM-S, FS-S	5719, 5719, 5973, 5973, 5973, 5697, 5697, 7697
VIPRO	<i>Viola primulifolia</i> ssp. <i>occidentalis</i> western bog violet		O-1, BLM-S, FS-S	

Alternative 10 - Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Alt. 10 # of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress	3	O-1, FS-LE	5647, 5650, 5650
CAHO3	<i>Calochortus howellii</i> Howell's mariposa-lily	10	O-1, BLM-S, FS-S	5638, 5653, 5657, 5664, 5969, 5954, 5640, 5643, 5643, 5265
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort	5	O-4, BLM-S, FS-S	5648, 5649, 5649, 5707, 5649
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb	3	O-1, BLM-S, FS-S	6204, 6204, 6204
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria	4	O-2, BLM-A, FS-S	5623-#3, 5623-#4, 5623#6, 5623-#5
GESE2	<i>Gentiana setigera</i> Elegant gentian	3	OR-1, FS-S	5432, 5308, 5308
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris	8	O-1, BLM-S, FS-S, State-T	5996, 5641, 5683, 5641, 5667, 5683, 5986, 5359
MOPU	<i>Monardella purpurea</i> Siskiyou monardella	11	O-2, BLM-A, FS-S	5680, 5669, 5642, 5737, 5627, 5646, 5637, 5637, 6221, 6221, 6221
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah		O-1, BLM-S, FS-S	
SADE2	<i>Salix delnortensis</i> Del Norte willow	1	O-2, BLM-A, FS-S	5651
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	11	O-1, BLM-S, FS-S	5655, 5655, 5636, 5655, 5655, 5629, 5674, 5985, 5639, 5639, 5711
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	20	O-1, BLM-S, FS-S	5972, 5719(+18 sites on Rd. 461 & 445)
VIPRO	<i>Viola primulifolia</i> ssp. <i>occidentalis</i> western bog violet	2	O-1, BLM-S, FS-S	5665, 3933

Alternative 11 - Sensitive plant species Potentially Impacted NICORE Project Area

Codes SNF	Species (common name)	Alt. 11 # of Sites Impacted	STATUS	DATA SHEET No.
ARMC	<i>Arabis macdonaldiana</i> Macdonald's rock-cress		O-1, FS-LE	
CAHO3	<i>Calochortus howellii</i> Howell's mariposa-lily	5	O-1, BLM-S, FS-S	5638, 5653, 5657, 5664, 5969
CANUG	<i>Cardamine nuttallii</i> var. <i>gemmata</i> yellow-tubered toothwort		O-4, BLM-S, FS-S	
EPOR	<i>Epilobium oreganum</i> Oregon willow-herb		O-1, BLM-S, FS-S	
FRGL2	<i>Fritillaria glauca</i> Siskiyou fritillaria	4	O-2, BLM-A, FS-S	5623-#3, 5623-#4, 5623#6, 5623-#5
GESE2	<i>Gentiana setigera</i> Elegant gentian		O-1, FS-S	
HABR2	<i>Hastingsia atropurpurea</i> purple-flowered rush-lily		O-1, BLM-S, FS-S	
LIGRG	<i>Limnanthes gracilis</i> var. <i>gracilis</i> slender meadow-foam		O-1, BLM-S, FS-S	
MIHO	<i>Microseris howellii</i> Howell's microseris	6	O-1, BLM-S, FS-S, State-T	5996, 5641, 5683, 5641, 5667, 5683
MOPU	<i>Monardella purpurea</i> Siskiyou monardella	3	O-2, BLM-A, FS-S	5642, 5737, 5627
PEER	<i>Perideridia erythrorhiza</i> Red-root yampah	1	O-1, BLM-S, FS-S	5656
SADE2	<i>Salix delnortensis</i> Del Norte willow	1	O-2, BLM-A, FS-S	5668
SEHE	<i>Senecio hesperius</i> Siskiyou butterweed	5	O-1, BLM-S, FS-S	5655, 5655, 5636, 5629, 5674
STHO	<i>Streptanthus howellii</i> Howell's streptanthus	13	O-1, BLM-S, FS-S	5972, 5719, 5719, 5719, 5719, 5719, 5719, 5719, 5719, 5719, 6008, 6008, 6008
VIPRO	<i>Viola primulifolia</i> ssp. <i>occidentalis</i> western bog violet		O-1, BLM-S, FS-S	